

Proximity to Expressways & Influence on HDB Resale Prices

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Background

- HDB flats are home to >80% of Singapore's population
- 10 expressways covering >170km island wide
- Many HDB flats are situated near expressways



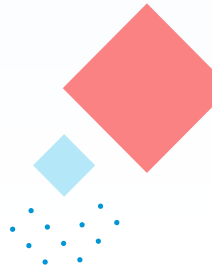


PROBLEM STATEMENT

Amid conflicting claims of noise pollution versus unblocked views (at high floors) by netizens, **does proximity to expressways have any influence on HDB Resale Prices?**



Core Business Questions

1. How does proximity to expressways influence overall HDB resale prices?
 2. Is the impact of expressway proximity on HDB resale prices different for lower floors compared to higher floors?
 3. How do other factors, such as flat characteristics (eg. no. of bedrooms, age, town), interact with expressway proximity to influence resale prices?
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Datasets



HDB Resale Flat Prices

Jan 2015 to 2024



National Map Line (SLA)

Road coordinates of all
10 existing expressways



OneMap Reverse Geocode

Identify HDB buildings
located within a specified
radius of a given coordinate
along the expressway

Proximity to Expressway

What is a suitable threshold for proximity?

- Research suggests that highway noises can be heard from up to 1km away
- In densely urban Singapore, other buildings may 'shield' some of the noise
- Investigate various proximities:
 - $\leq 50\text{m}$ (most significantly affected)
 - 51-100m
 - 101-150m
 - 151-300m
 - 301-500m
 - $>500\text{m}$ (unlikely to be affected)

Table 1: TYPICAL RANGE OF SOUND

Common Outdoor Activities	Noise Level dBA	Common Indoor Activities
Jet Fly-over at 300 m (1000 ft)	--110--	Rock Band
Gas Lawn Mower at 1 m (3 ft)	--100--	
Diesel Truck at 15 m (50 ft), at 80 km/hr (50 mph)	--90--	Food Blender at 1 m (3 ft)
Noisy Urban Area, Daytime	--80--	Garbage Disposal at 1 m (3 ft)
Gas Lawn Mower, 30 m (100 ft)	--70--	Vacuum Cleaner at 3 m (10 ft)
Commercial Area	--60--	Normal Speech at 1 m (3 ft)
Heavy Traffic at 90 m (300 ft)	--50--	Large Business Office Dishwasher Next Room
Quiet Urban Daytime	--40--	Theater, Large Conference Room (Background)
Quiet Urban Nighttime	--30--	Library
Quiet Suburban Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
Quiet Rural Nighttime	--10--	Broadcast/ Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold Human Hearing

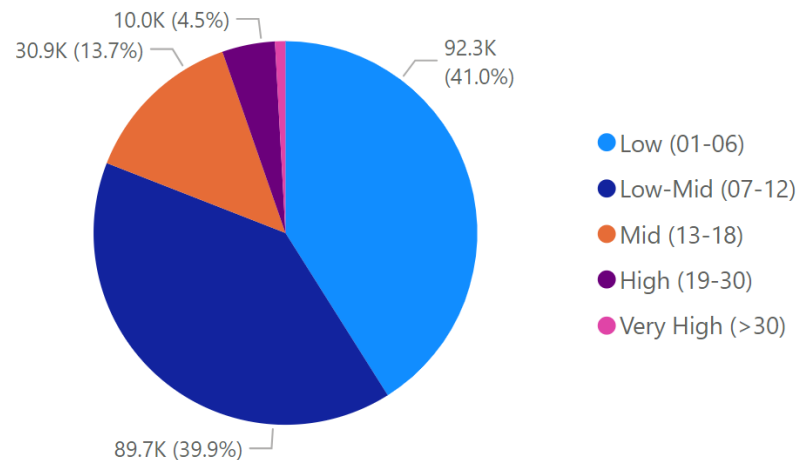
Source: CALTRANS Technical Noise Supplement, 1998

Floor Classification

What floors are considered “high”?

- No specific guideline & is subjective
- Some netizens suggest that >20 floors is considered high
- Group HDB floor range into 5 categories
- Lower levels are more likely to be impacted by noise
- Higher levels are more likely to benefit from unobstructed views

Proportion of Resale Flats in Each Floor Category

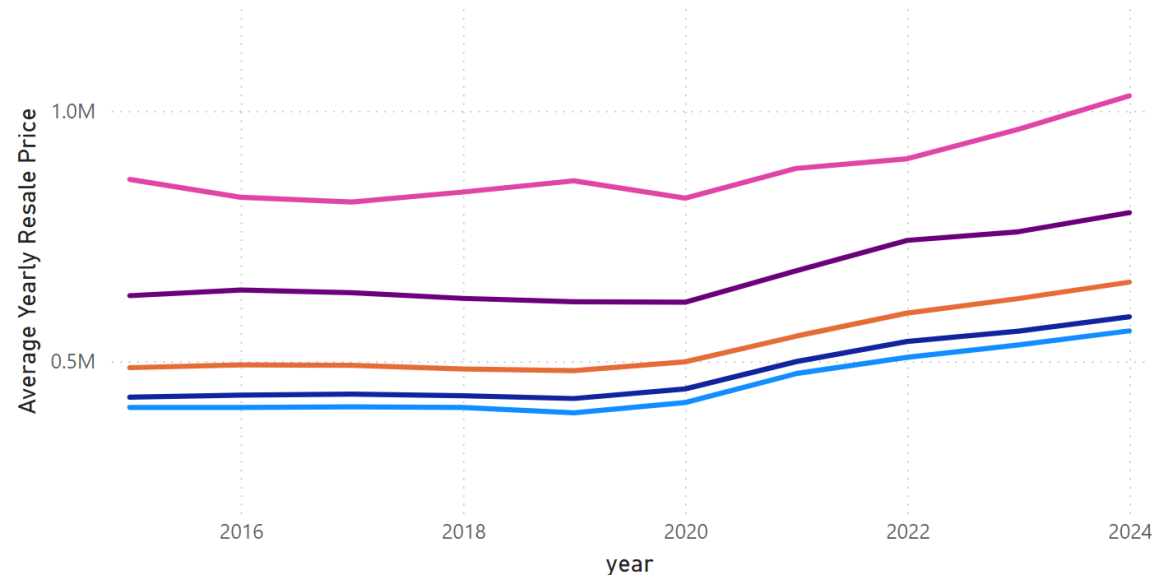


Existing Trends in HDB Resale Prices

- HDB resale prices have been rising over the years
- This trend is also observed across all floor categories
- Higher floors command a price premium

Average Resale Price by Year & Floor Category

Floor Category ● Low (01-06) ● Low-Mid (07-12) ● Mid (13-18) ● High (19-30) ● Very High (>30)



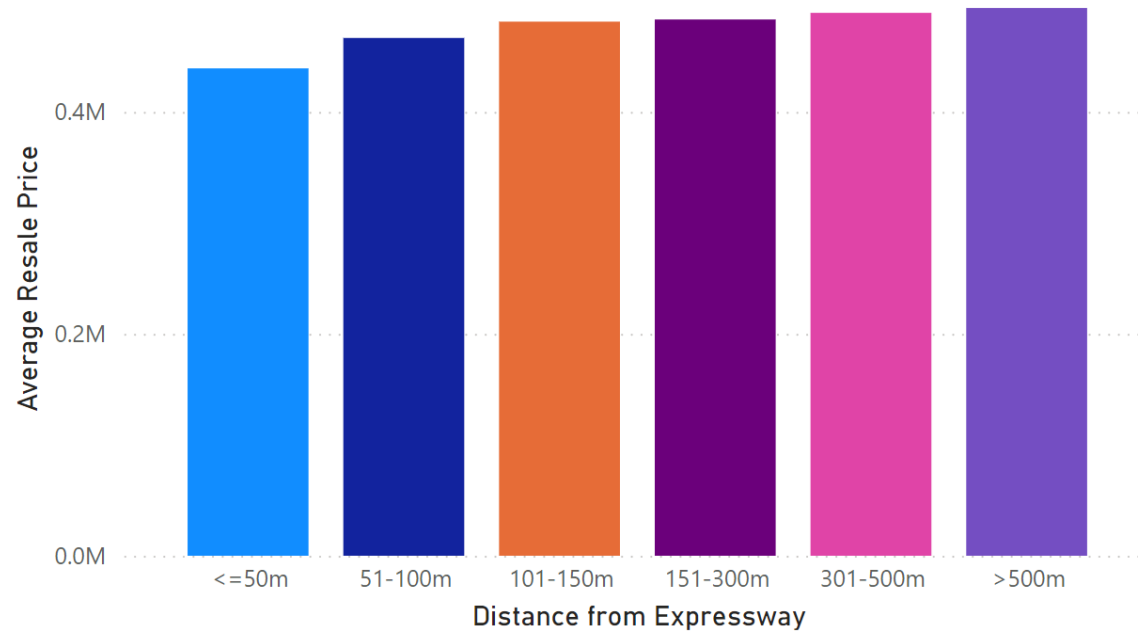


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**How does proximity to expressways influence
overall HDB resale prices?**

In general, the average HDB resale price appears **lower** the nearer it is to the expressway

Average Resale Price based on Distance from Expressway (2015-2024)

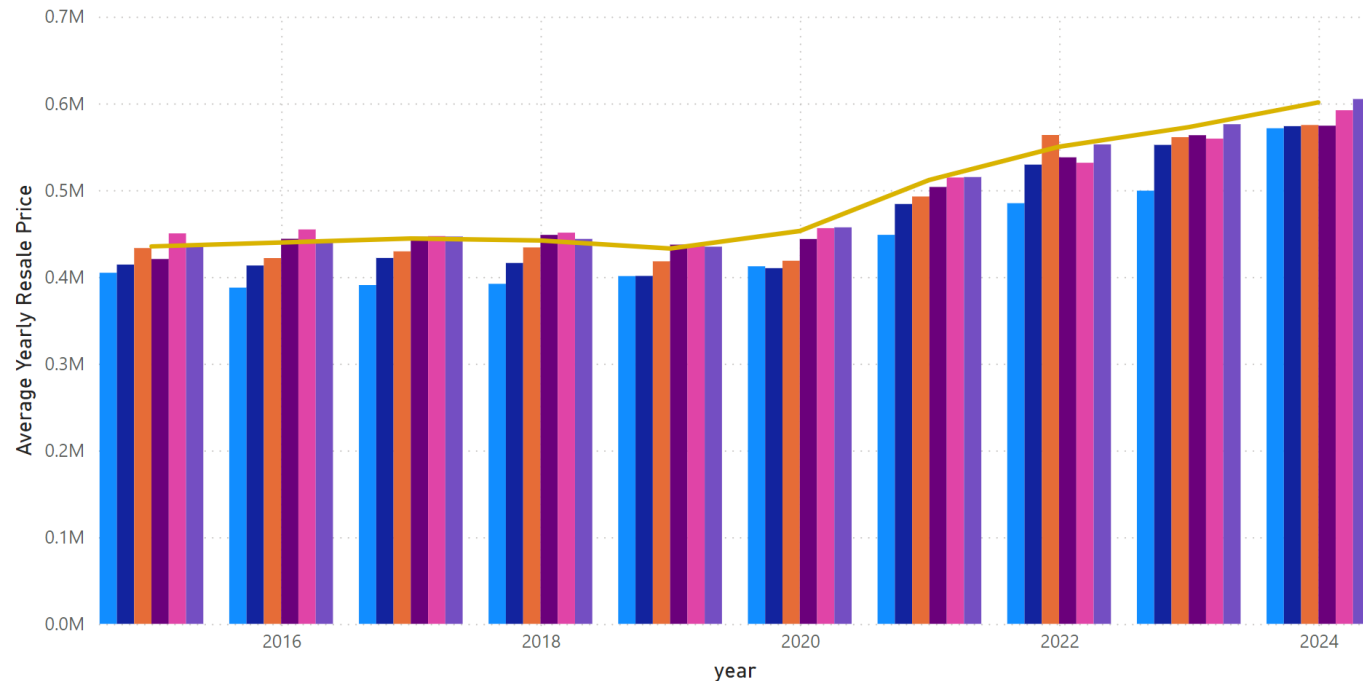


A similar trend is observed across all years.

Additionally, it appears that resale flats **301-500m** from expressways have **similar valuation** to those **>500m** away.

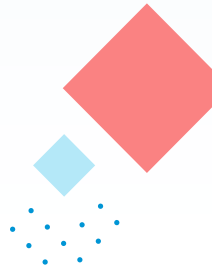
Average Resale Price by Year & Distance from Expressway

Distance from Expressway ● ≤50m ● 51-100m ● 101-150m ● 151-300m ● 301-500m ● >500m ● Average of resale_price





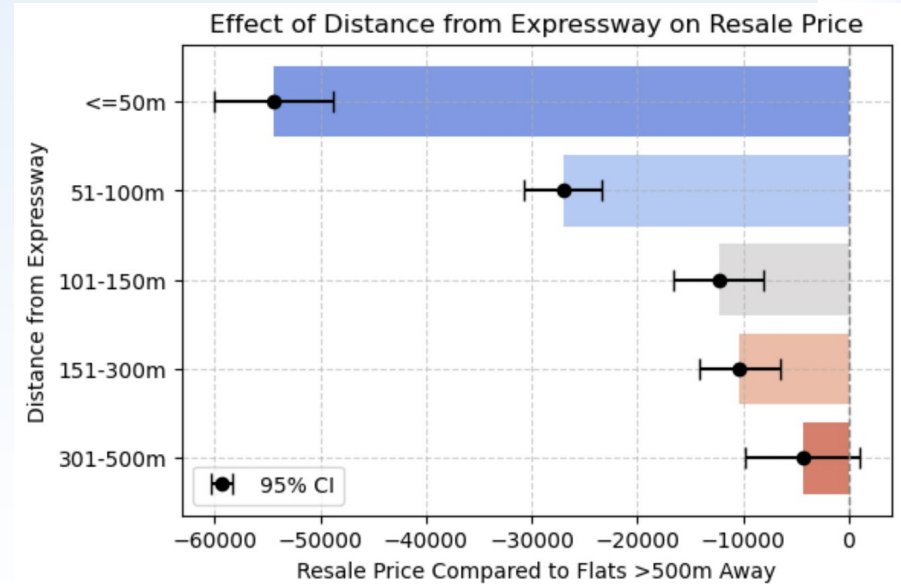
Linear Regression Analysis

- Applied to quantify the difference observed in resale flat prices based on distance to expressway
 - **Baseline linear regression:**
 - Variables: 'distance_from_expressway'
 - One-hot encoded, with flats >500m from expressways as the reference point
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Results of Linear Regression Analysis

Compared to flats far away from expressways (>500m), average resale flat prices for flats less than 300m to expressways are significantly lower.

- Resale flats **less than 50m** from expressways are the most affected, with a **lower** average resale price of **\$54415**.
- Flats 301-500m away have a lower average resale price of \$4390, but this difference is not significant.



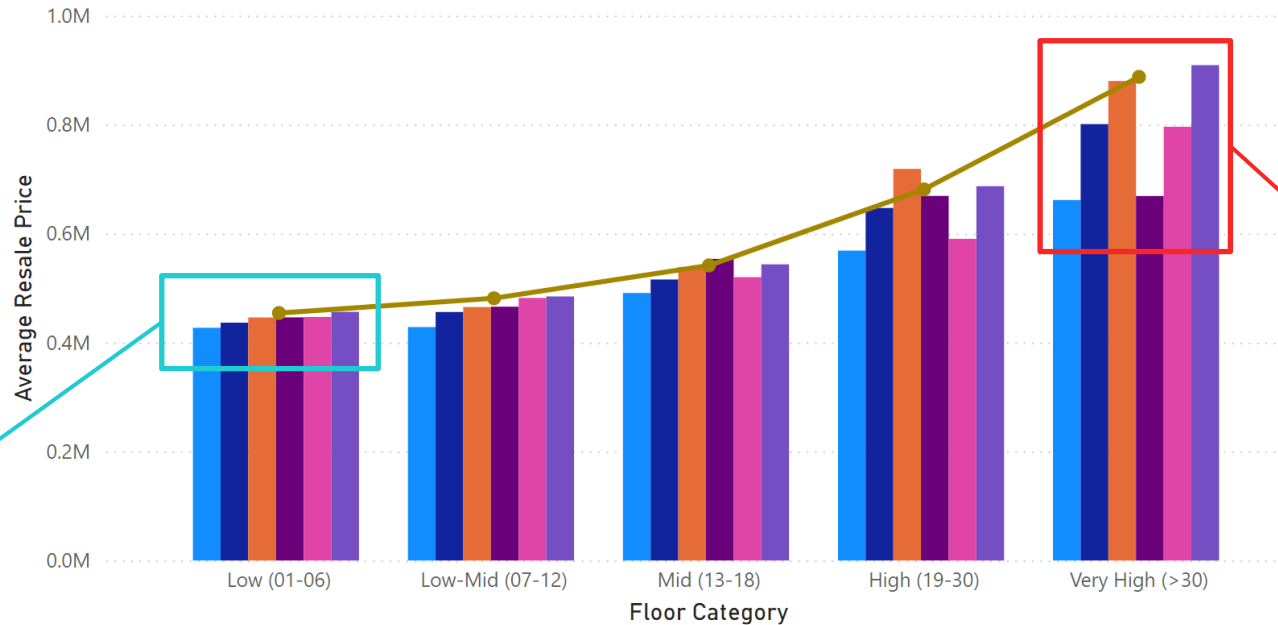


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**Is the impact of expressway proximity on
HDB resale prices different for lower floors
compared to higher floors?**

Average Resale Price by Floor Category and Distance from Expressway

Distance from Expressway ● ≤50m ● 51-100m ● 101-150m ● 151-300m ● 301-500m ● >500m ● Average of resale_price

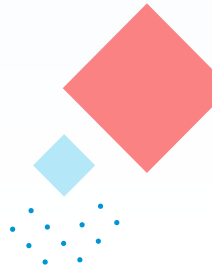


At low floors, average resale price does not appear to vary much based on distance from expressway

However at higher floors, the difference in average resale price is more apparent



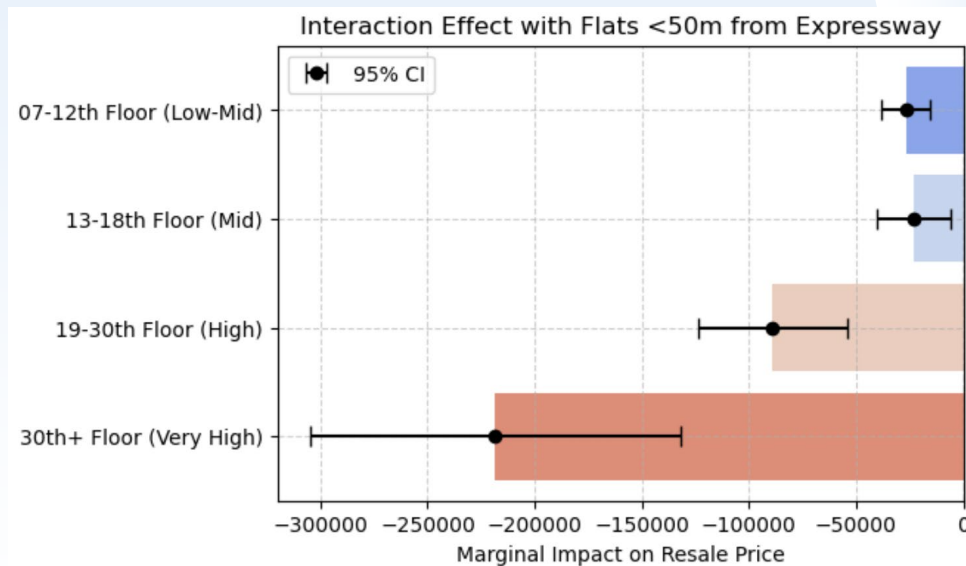
Linear Regression Analysis (II)

- **Add-on floor & floor-proximity interaction variables** to regression model
 - Additional variables: 'storey_range_category' & interaction terms
 - One-hot encoded with low floors (storey 1 to 6) as the reference point
 - Interaction terms to analyse interaction of different floors on the resale flat prices
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Results of Linear Regression Analysis (II)

Focusing on the interaction term of different floors for **flats <50m to an expressway**, it is observed that the negative impact of being close to an expressway on resale price is much **more pronounced for higher-floor flats** compared to those on lower floors.


Notably the marginal negative impact of very high (>30) floors is more than \$200,000 compared to low (1st to 6th) floors, if less than 50m from an expressway.





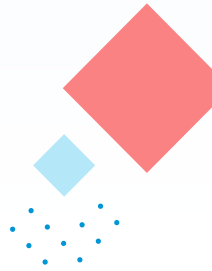
3

How do other factors, such as flat characteristics (eg. no. of bedrooms, age, town), interact with expressway proximity to influence resale prices?



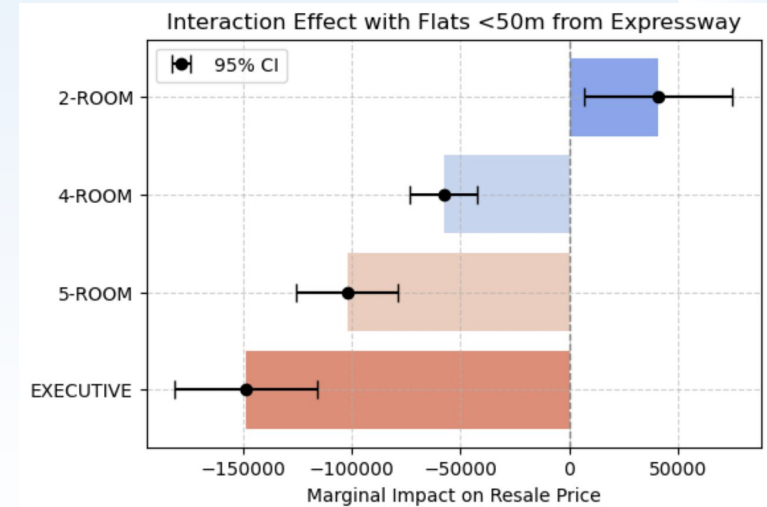


Linear Regression Analysis (III)

- **Add-on features relating to flat characteristics** to regression model
 - Additional variables: flat_type (eg. 3-room, 4-room), floor_area_sqm (flat size), remaining_lease_years (remaining duration of lease) & interaction terms
 - 'flat_type' is one-hot encoded with 3-room flats as the reference point
 - Interaction terms for **distance and various flat features**
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Results of Linear Regression Analysis (III)

- Size of flat (floor_area_sqm) & duration of remaining lease (remaining_lease_years) *did not have any significant impact* on resale flat prices.
- Focusing on the interaction term of different flat types for **flats <50m to an expressway**, it is observed that the marginal negative impact on resale price when being close to an expressway is much **more pronounced for large flat types (eg. Executive or 5-Room)** compared to a 3-room flat.



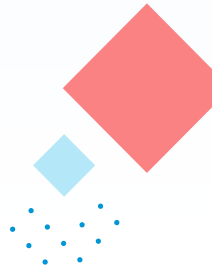


Key Findings





Key Findings

- In-line with sentiments by netizens, the **value of resale flats are lower if situated near to an expressway**. This impact is most significant for flats right beside (<50m) an expressway. However, there appears to be a threshold of about **300m** from an expressway, where beyond that resale prices are not significantly affected.
 - Opposite to sentiments by netizens, the **value of resale flats are negatively affected for higher floors that are near expressways**. Notably, their value declines much more compared to lower floors, if they are situated near expressways (< 50m) as compared to far away (>500m).
 - A similar trend is observed for larger flat types (eg. Executive, 5-Room)
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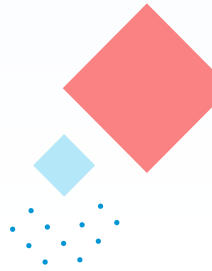


Limitations & Future Work

Limitations

- Direction of units (facing highway or away) from highways were not included.

Future Work

- Take into account more features (eg. proximity to amenities)
 - Attempt Longitudinal Studies (eg. time series) to model the changes in resale flat prices over time
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Thank you!

